

Office of Research and Development (ORD)

ORD Labs and Centers: ORD comprises three National Laboratories and two National Centers. Most of the National Laboratories and Centers have multiple research facilities (Figure 2). The brief descriptions of the ORD Laboratories and Centers listed below include which aspect of the risk paradigm they support (*italics*).

- **National Health and Environmental Effects Research Laboratory (NHEERL)**

(www.epa.gov/nheerl/) conducts research on the effects of contaminants and environmental stressors on human health and the environment. *Hazard identification and dose-response assessment*

- **National Exposure Research Laboratory (NERL)** (www.epa.gov/nerl/) conducts research to improve the scientific bases for human and ecosystem exposure assessment. *Exposure assessment*

- **National Center for Environmental Assessment (NCEA)** (www.epa.gov/ncea/) conducts research in risk assessment methods, and serves as a national resource for human health and ecological risk assessment by conducting assessments and developing new methods and tools for risk management. *Risk characterization*

- **National Risk Management Research Laboratory (NRMRL)** (www.epa.gov/ORD/NRMRL/) conducts research and technology transfer to prevent, mitigate, and control pollution. *Risk management*

- **National Center for Environmental Research and Quality Assurance (NCERQA)**

(www.epa.gov/ncerqa/) manages an extramural research program (grants, fellowships, and national centers of excellence) known as Science to Achieve Results (STAR) to complement ORD's internal research program and expand EPA's science and technology base. NCERQA also develops EPA-wide quality assurance policies and manages EPA's peer review process. *All phases of risk assessment and risk management*

With this approach and organizational structure, ORD can assure that science resources are directed to the most pressing environmental problems posing the greatest risks to people and the environment. We will continue to bring our creativity and technical expertise to meet the environmental science needs of today while positioning ourselves to identify and aid in resolving the environmental problems of tomorrow.

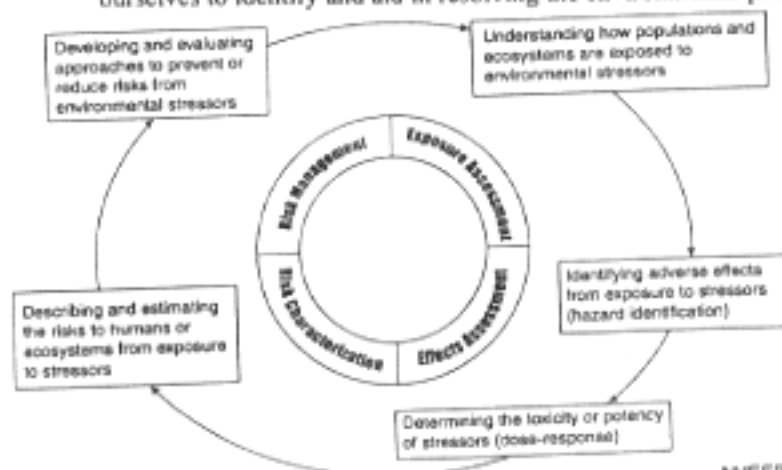


Figure 1. The risk assessment-risk management framework used by ORD to organize its research and development activities.

Figure 2.
ORD Locations



NCEA	National Center for Environmental Assessment
NCERQA	National Center for Environmental Research and Quality Assurance
NERL	National Exposure Research Laboratory
NHEERL	National Health and Environmental Effects Research Laboratory
NRMRL	National Risk Management Research Laboratory

Overview of ORD:

As we get up each morning and get ready for another day, we often take for granted that the water from the faucet we use to make our coffee is drinkable, the food we feed our children is safe, and the air we breathe is healthful. Not until we need to take unusual steps, such as boiling our water to eliminate microbial contamination or reducing physical activity on ozone action days, do we realize how fragile our environment can be and how important it is to protect it. The mission of the U.S. Environmental Protection Agency (EPA) is to protect human health and to safeguard the natural environment – air, water, and land – upon which life depends. Although EPA has made substantial progress in both cleaning up and protecting these natural resources, many challenges remain, and new human health and environmental problems continually confront the Agency.

Responding to these challenges requires research to understand these problems and to develop technologies to solve them. The Office of Research and Development (ORD) is the primary arm of EPA responsible for carrying out this work. ORD supports EPA's mission by conducting state-of-the-art research in all environmental media (air, water, and land) to address unanswered scientific questions. As part of its research efforts, ORD develops innovative methods and approaches for solving problems that range from broad scientific issues such as global climate change, to specific problems such as removing microbes from drinking water systems. To make the most efficient use of resources and research dollars, ORD relies on extensive collaboration among ORD Laboratories and Centers, EPA partners in the program and regional offices, and the external scientific community. In addition, ORD has made independent peer review an integral part of its programs to ensure ORD's research is of the highest quality.

Credible Environmental Research: For any research organization to have credibility within the scientific community, its research must be able to withstand the rigors of scientific scrutiny. ORD has made the peer review process an integral part of its research program to ensure that its research is based on sound methodologies and generates credible data. Peer review is an independent evaluation of a work product by experts who have not participated in developing the work product. Peer review can be internal (evaluation by experts within EPA), or external (evaluation by independent experts outside of EPA, such as EPA's Science Advisory Board). ORD recognizes the importance of its research to both the Agency (for use in regulatory decisions) and the scientific community (for application to specific environmental problems), and strives to conduct the best science possible.

The Risk Paradigm: To understand ORD's research program, it helps to be familiar with the "risk paradigm," an important Agency organizing principle. The risk paradigm consists of two interrelated phases, risk assessment and risk management. Risk assessment is the process used to evaluate the degree and probability of harm to human health and the environment from such stressors as pollution or habitat loss. The risk assessment process, as proposed by the National Academy of Sciences (NAS) in 1983, consists of:

- Exposure Assessment - describing the populations or ecosystems exposed to stressors and the magnitude, duration, and spatial extent of exposure
- Hazard Identification - identifying adverse effects (e.g., short-term illness, cancer) that may occur from exposure to environmental stressors
- Dose-Response Assessment - determining the toxicity or potency of stressors
- Risk Characterization - using the data collected in the first three steps to estimate and describe the effects of human or ecological exposure to stressors

Risk management entails determining whether and how risks should be managed or reduced. It is based on the results of the risk assessment as well as other factors (e.g., public health, social, and economic factors). Risk management options include pollution prevention or control technologies to reduce or eliminate the pollutant or other stressor on the environment. The environmental or public health impacts resulting from risk management decisions must then be monitored so that any necessary adjustments can be made. A simple diagram of this cycle of risk assessment and risk management is shown in Figure 1 (with the steps of hazard identification and dose-response assessment combined into a category entitled Effects Assessment).

ORD has aligned its organizational structure to comport with this risk paradigm and has made the principles central to its strategy for determining priorities for environmental research. Several topics in the report are presented in terms of the risk paradigm, with accomplishments linked to discrete components of the paradigm. For other topics the risk paradigm was not used, either because the accomplishments could not be cleanly divided among the different risk steps or because most of the accomplishments fell within a single step of the paradigm.